# Before the **Federal Communications Commission** Washington, DC 20554

In the Matter of

Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service IB Docket No. 05-20

### REPLY COMMENTS OF ARINC INCORPORATED

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#### **SUMMARY**

The Commission should adopt its aggregate off-axis envelope proposal and reject the alternative of applying the off-axis limits to individual AES terminals. The aggregate off-axis envelope has been proven to protect the FSS from harmful interference and is fully consistent with Recommendation ITU-R M.1643. Additionally, the issues of feasibility and operational flexibility demonstrate that the aggregate mask is the superior approach. The record confirms these points.

The Commission should reject its proposal to lower the e.i.r.p. density limits in the context of multiple co-frequency transmissions, because the record shows that it is unnecessarily restrictive. However, the Commission's proposal to allow minor variances in the aggregate mask should be adopted; it is supported by the experienced AMSS providers and unopposed by others. Likewise, the Commission should adopt a rule allowing AMSS operators to coordinate AES transmissions in excess of the off-axis e.i.r.p. envelope.

Importantly, the Commission should *not* adopt a 0.2° pointing accuracy requirement in the AMSS context. In addition to being inconsistent with WRC-03, such a rule is unnecessary in light of the off-axis e.i.r.p. envelope, is not useful in protecting adjacent satellites from harmful interference, and would have the unintended consequence of limiting technological advancement. Moreover, no party offers anything of substance to support such a misplaced rule.

As to the tracking of AES terminals, the Commission should proceed with caution in this area. The record shows that this type of information is extremely sensitive and its disclosure raises safety, security, and business intelligence concerns. Thus, to the extent the Commission adopts a tracking information rule, it should, at the most, require AMSS operators to share

certain tracking data only upon the occurrence of a harmful interference event and without any information that might identify the particular aircraft and/or its owner or passengers.

Additionally, the Commission should: (1) authorize Ku-band AMSS operators to operate with ALSAT authority; (2) allow the use of contention protocols permitting statistically infrequent simultaneous co-frequency transmissions that briefly exceed the off-axis e.i.r.p. envelope, as proposed in the Part 25 streamlining proceeding; (3) permit AMSS downlink operations in the "extended" Ku-band, given that this proposal is unopposed; and (4) allow current TDRSS and RAS sites to be coordinated on a site-by-site based between NTIA and AMSS operators, and determine the requisite protection levels for future TDRSS and RAS sites in future rulemakings pertaining to those sites.

Finally, the Commission should abstain from adopting any rule of general applicability to address the public safety and national security concerns of the federal government. Instead, the prudent approach on this issue is for each AMSS provider to work informally with the Departments of Justice and Homeland Security to address their legitimate needs and concerns.

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### REPLY COMMENTS OF ARINC INCORPORATED

ARINC Incorporated ("ARINC") hereby submits its reply comments in response to the Commission's *Notice of Proposed Rulemaking* in the above-captioned proceeding.<sup>1</sup>

- I. THE COMMISSION SHOULD ADOPT AGGREGATE EIRP DENSITY LIMITS AND ABSTAIN FROM IMPOSING MULTIPLE OPERATING RESTRICTIONS THAT ACHIEVE THE SAME OBJECTIVE.
  - A. The Commission Should Adopt the Aggregate Envelope Approach.

The Commission should adopt its aggregate off-axis e.i.r.p. envelope proposal and reject the alternative of applying the off-axis limits to individual AES terminals.<sup>2</sup> The aggregate off-axis envelope has been proven to protect the FSS from harmful interference, and is fully

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See Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service, Notice of Proposed Rulemaking, 20 FCC Rcd 2906 (2005) (the "NPRM" or "Notice").

<sup>&</sup>lt;sup>2</sup> See NPRM ¶¶ 35-37.

consistent with Recommendation ITU-R M.1643.<sup>3</sup> Additionally, the issues of feasibility and operational flexibility confirm that the aggregate mask is the superior approach.<sup>4</sup>

Boeing correctly points out that "[t]he Commission's concerns with respect to the ability of AMSS systems to control dynamically AES transmissions to meet aggregate off-axis e.i.r.p. limits are entirely unfounded." Telesat is the only party to oppose the aggregate mask, expressing "doubts" that the system control is possible. However, ARINC's and Boeing's *real world experience* demonstrates that they can manage AMSS transmissions on a real-time basis to meet the aggregate mask, and neither ARINC's nor Boeing's system has received any complaints of harmful interference. This is buttressed by "SES Americom's *experience* in providing capacity to AES system operators indicat[ing] that these terminals can be deployed without

See Comments of ARINC Incorporated, IB Docket No. 05-20, at 3-4 (July 5, 2005) ("ARINC Comments").

See id. at 4.

Comments of The Boeing Company, IB Docket No. 05-20, at 21 (July 5, 2005) ("Boeing Comments").

Comments of Telesat Canada, IB Docket No. 05-20, at 3 (July 5, 2005) ("Telesat Comments"). Telesat is the only commenter to question the aggregate mask; the other FSS commenters all appear to support it. *See* Comments of SES Americom, IB Docket No. 05-20, at 3 (July 5, 2005) ("SES Americom Comments") (supporting "aggregate power density limits"); Comments of Intelsat, Ltd., IB Docket No. 05-20, at 3 (July 5, 2005) ("Intelsat Comments") (agreeing that AMSS systems should be operated so that "the aggregate uplink off-axis e.i.r.p. density levels produced by all simultaneously co-frequency transmitting AES terminals do not exceed the levels coordinated"); Comments of PanAmSat Corporation, IB Docket No. 05-20, at 3 & n.6 (July 5, 2005) ("PanAmSat Comments") (supporting "the off-axis EIRP density limits proposed by the Commission in [paragraph 35] the NPRM," which is the aggregate mask proposal).

See Boeing Comments at 21 (noting "the interference-free operation of the Connexion system"). ARINC has operated its SKYLink<sup>SM</sup> system continuously since June 2003, see ARINC Comments at 2, and, like Boeing's Connexion system, has had no complaints of harmful interference.

creating harmful interference for incumbent operations" and its wholehearted support for "aggregate power density limits" and the "use of dynamic power assignment."

ARINC likewise agrees with ViaSat that the Commission's rules should be "technology neutral," and that "[t]o avoid . . . restraint on innovation, the Commission should establish an aggregate network-wide limit and give AMSS operators wide latitude to operate in any manner within the limit." This is necessary because, among other things, "different parts of the satellite footprint . . . require different power levels to achieve a consistent quality of service." Individual AES e.i.r.p. density limits would, as Boeing points out, "foreclose advanced AMSS network management techniques," and "adversely affect [an AMSS operator's] ability to service its many AMSS customers." In short, AMSS providers – like ARINC – that employ sophisticated network management systems "have the capability of controlling the network total aggregate EIRP density such that the aggregate limit is met for the network, while ensuring the

<sup>8</sup> SES Americom Comments at 2 (emphasis added).

<sup>&</sup>lt;sup>9</sup> *Id.* at 3.

Comments of ViaSat, Inc., IB Docket No. 05-20, at 7 (July 5, 2005) ("ViaSat Comments").

<sup>11</sup> *Id.* at 6.

Boeing Comments at 21.

most efficient distribution of power to terminals throughout the network."<sup>13</sup> Accordingly, the Commission should adopt the aggregate mask, and reject the individualized approach.<sup>14</sup>

The Commission also should reject its proposal to lower the e.i.r.p. density limits in the context of multiple co-frequency transmissions.<sup>15</sup> That proposal is unnecessarily restrictive, as it would rapidly degrade AMSS service at the lower G/T contours of the serving satellite without offering any additional protection against harmful interference.<sup>16</sup> Boeing confirms that this proposal would "seriously undermine the existing operations and future development of AMSS systems"<sup>17</sup> by "seriously handicap[ping] bandwidth-on-demand system[s] . . . because it does not account for the varying capacity needs of individual AESs" and by "unnecessarily reduc[ing] the efficiency of such systems."<sup>18</sup> ViaSat, too, accurately catalogs the proposal's deficiencies.<sup>19</sup> For

ViaSat Comments at 6-7; *see also id.* at 6 (explaining that "an aggregate limit is preferable in a CDMA network with a sophisticated network management system," like ARINC's network). SES Americom makes several of the same points in its comments. *See* SES Americom Comments at 3 (noting that "aggregate power limits provide flexibility by permitting a network control center to assign power limits to individual terminals," and that "this flexibility is important for AES networks" because "dynamic power assignment [allows operators] to maximize the overall efficiency of their systems").

On a related point, ARINC supports Boeing's and ViaSat's respective proposals to begin the off-axis mask from at least 1.5° instead of 1°. *See* Boeing Comments at 16; ViaSat Comments at 4.

<sup>&</sup>lt;sup>15</sup> *See NPRM* ¶ 36.

See ARINC Comments at 5.

Boeing Comments at 21.

<sup>&</sup>lt;sup>18</sup> *Id.* at 22.

In particular, ViaSat explains that the proposal is "overly simplistic because it assumes that the network is made up of homogeneous AES transmitters"; it does not adequately account for "the various factors that affect the level of power required to be transmitted from an AES terminal and the resulting power density to be received at the spacecraft"; it "would result in an inefficient distribution of power among the terminals in a network"; and "would not allow a CDMA network operator to maximize the throughput of its network." ViaSat Comments at 9.

all of these reasons, the Commission should not adopt its proposal to lower e.i.r.p. density limits in the context of multiple co-frequency transmissions.

The Commission should, however, adopt its proposal to allow minor variances in the aggregate mask.<sup>20</sup> Industry experience has shown that minor variances should be allowed and, indeed, the Commission recently adopted an analogous rule in the ESV context.<sup>21</sup> Boeing, ViaSat, and Intelsat all agree that the Commission should adopt this proposal,<sup>22</sup> and no other commenting party disagrees. Thus, minor variances in the e.i.r.p. envelope should be allowed. Moreover, ARINC also supports ViaSat's proposal that the Commission allow for greater power variations in the elevation plane, for the reasons ViaSat sets forth in its comments.<sup>23</sup>

Finally, the Commission should adopt a rule allowing AMSS operators to coordinate AES transmissions in excess of the off-axis e.i.r.p. envelope.<sup>24</sup> As ARINC has explained,<sup>25</sup> this would promote the Commission's goals of "maximizing the efficient use of Ku-band spectrum,"<sup>26</sup> and of "market-driven deployment of broadband technologies,"<sup>27</sup> while still "protecting existing services from harmful interference."<sup>28</sup> None of the commenters opposes the principle of allowing for coordination of higher power levels and, indeed, each of the FSS

 $NPRM \ \ 38.$ 

See ARINC Comments at 6.

See Boeing Comments at 18; ViaSat Comments at 14; Intelsat Comments at 4.

See ViaSat Comments at 14-17.

*See NPRM* ¶ 40.

See ARINC Comments at 7.

NPRM  $\P$  4.

Id.  $\P 2$ .

<sup>&</sup>lt;sup>28</sup> *Id.* 

commenters supports it.<sup>29</sup> However, contrary to the suggestions that a certification from adjacent satellite operators should sometimes be required,<sup>30</sup> Boeing is correct that "[c]ertification [from the serving satellite operator] would provide [sufficient] confirmation that the proposed power levels have been coordinated, and ensure that the AMSS licensee and its satellite operator can be held accountable for their representations in the licensing proceeding."<sup>31</sup> Accordingly, the Commission should allow for coordination of power levels in excess of the off-axis e.i.r.p. limits, and, procedurally, should only require a certification from the serving satellite operator.

## B. The Commission Should Not Adopt A Pointing Accuracy Requirement.

The Commission should not adopt a requirement for 0.2° pointing accuracy in the AMSS context.<sup>32</sup> As ARINC has explained, in addition to being inconsistent with WRC-03, such a rule is unnecessary in light of the off-axis e.i.r.p. envelope, is not useful in protecting adjacent satellites from harmful interference, and would have the unintended consequence of limiting technological advancement.<sup>33</sup> Boeing agrees that the 0.2° pointing accuracy proposal is not consistent with WRC-03 and "may unnecessarily constrain AMSS system development and

See Intelsat Comments at 5 (arguing for "operator-to-operator coordination" where there is "agreement for operations at levels in excess of those contained in Part 25"); PanAmSat Comments at 3 (noting agreement that AMSS systems "be permitted to operate with power levels that exceed the Commission's off-axis EIRP density limit if the power levels have been coordinated"); SES Americom Comments at 4 (supporting "certification procedure permitting AES applicants whose proposals are not eligible for routine processing to coordinate their operations"); Telesat Comments at 3 (noting that AMSS operations "with EIRP density levels exceeding the mandated values should be permitted" with "evidence of coordination").

See Intelsat Comments at 5; PanAmSat Comments at 4.

Boeing Comments at 25. *See also id.* ("Given that AMSS licensing proceedings are subject to notice and public comment, and thus can be challenged by interested parties, a certification from the serving satellite operator should be more than sufficient to establish that the proposed AMSS operations are consistent with the satellite's coordinated parameters.").

<sup>&</sup>lt;sup>32</sup> *See NPRM* ¶ 41(i).

<sup>33</sup> See ARINC Comments at 8-13.

deployment, particularly since the off-axis e.i.r.p. density limits already take pointing error into account."<sup>34</sup> ViaSat, too, confirms that "[t]he Commission should refrain from adopting an antenna pointing requirement"<sup>35</sup> and explains thoroughly the reasons why this is true.<sup>36</sup>

By contrast, certain FSS operators, while presumably in favor of the 0.2° pointing accuracy proposal, offer nothing of substance to support it.<sup>37</sup> Instead, they merely offer generic support for the Commission's proposal in paragraph 41(i) of the *Notice*, the lion's share of which is taken directly from Recommendation ITU-R M.1643, Annex 1, Part A, Section 2.1, which only requires AMSS applicants to "account for" certain antenna mispointing factors.<sup>38</sup> They thus offer no basis for the Commission's adoption of the misplaced 0.2° pointing accuracy proposal. This is especially true in light of the thorough presentations of ARINC, Boeing, and ViaSat – the parties most knowledgeable about AMSS systems – explaining in detail why it would be inadvisable for the Commission to adopt the 0.2° rule. Accordingly, the Commission should not require any specific pointing accuracy in the AMSS context.

Boeing Comments at 27.

ViaSat Comments at 17.

<sup>&</sup>lt;sup>36</sup> See id. at 17-20.

Intelsat and PanAmSat only generically support the Commission's general pointing accuracy proposals, and do not offer any specific support or discussion on the particular 0.2° pointing accuracy proposal. *See* Intelsat Comments at 5; PanAmSat Comments at 3. Telesat is even more vague in its support of a technical showing that the e.i.r.p. mask will not be exceeded. *See* Telesat Comments at 3. And, while the Satellite Users Interference Reduction Group ("SUIRG") is the only party to specifically mention its support of the 0.2° pointing accuracy proposal, it too offers nothing at all to justify its position. *See* Comments of the Satellite Users Interference Reduction Group, IB Docket No. 05-20, at 2 (June 27, 2005) ("SUIRG Comments").

Compare NPRM ¶ 41(i) (setting forth factors to be accounted for pertaining to the "[m]ispointing of AES antennas"), with ITU-R M.1643, Annex 1, Part A, Section 2.1 (same). As ARINC has explained, the 0.2° pointing accuracy proposal does not appear in Recommendation ITU-R M.1643; thus, it is *inconsistent* with WRC-03. See ARINC Comments at 8-9.

## II. THE COMMISSION SHOULD PROCEED CAUTIOUSLY IN EVALUATING AES TRACKING PROPOSALS.

To the extent the Commission adopts a tracking information rule, it should, at the most, require AMSS operators to share certain tracking data with frequency coordinators, FSS operators, the Commission or NTIA, but only upon a harmful interference event and without any information that might identify the particular aircraft and/or its owner or passengers.<sup>39</sup>

The comments largely support ARINC's position. Boeing, for example, correctly points out that "the sensitivity of this information suggests making it available only in the context interference resolution," and, accordingly, "such information should only be used in resolving reports of harmful interference or provided to the Commission in response to Commission enforcement activities." This is a sound approach because, as Boeing explains, "[t]o the extent a Ku-band AMSS provider does not cooperate with the Commission or any interested party in resolving claims of harmful interference, the Commission has enforcement mechanisms — including license revocation — to address such situations." Indeed, Telesat recognizes, as ARINC has explained, that "the best recourse is contact between satellite operators, with escalation to administrations when required in the absence of adequate response or difficulty in determining the operator responsible for the harmful interference."

<sup>39</sup> See ARINC Comments at 13-18.

Boeing Comments at 37. Likewise, ARINC agrees with Boeing that "provid[ing] real-time tracking data on an ongoing basis to the Commission or a third party" "is unnecessary and potentially raises security concerns." *Id. See also* ARINC Comments at 13-16. Accordingly, Intelsat's suggestion that tracking information be "maintained by the Commission" should be rejected. *See* Intelsat Comments at 6. Similarly, SUIRG's assertion that a tracking database be maintained by a third party and its claim that it would be the "ideal entity" to maintain such a database are not well taken and should also be rejected. *See* SUIRG Comments at 3.

Boeing Comments at 38.

See ARINC Comments at 16-17.

Telesat Comments at 4.

And ViaSat further confirms, as ARINC also has explained,<sup>44</sup> that "many customers require that location information of the AES not be disclosed for safety, security, and business intelligence reasons,"<sup>45</sup> and that "[g]overnment agencies have also expressed concerns regarding this information as it relates to national security, law enforcement, or military operations."<sup>46</sup> AMSS providers therefore should not be required to provide information that might identify the particular aircraft and/or its owner or passengers.

### III. THE FCC SHOULD EXTEND ALSAT AUTHORITY TO AMSS OPERATORS.

The Commission should authorize Ku-band AMSS operators to operate with ALSAT authority.<sup>47</sup> Boeing, ViaSat, and Telesat each agree.<sup>48</sup> PanAmSat, in contrast, is the sole naysayer, arguing that ALSAT authority is "ill advised", because AMSS services are "new and have a limited track record" and, therefore, "an extra degree of caution is warranted." But if an AMSS system is licensed by the Commission, all satellites adjacent to serving satellites are similarly situated: If the AMSS system complies with the off-axis e.i.r.p. limits with regard to adjacent satellites in any one location in the Commission's two-degree spacing environment, it will comply with regard to the satellites adjacent to another serving satellite in a different

See ARINC Comments at 13-16.

ViaSat Comments at 22.

<sup>&</sup>lt;sup>46</sup> *Id*.

See NPRM ¶ 51; ARINC Comments at 22-24.

Boeing Comments at 35-36; ViaSat Comments at 20-21; Telesat Comments at 4.

PanAmSat Comments at 4.

<sup>&</sup>lt;sup>50</sup> *Id.* at 5.

location.<sup>51</sup> The fact that AMSS services are relatively "new" does not change this basic engineering reality, nor does it provide a rational basis to deny ALSAT authority here.

# IV. THE COMMISSION SHOULD ALLOW USE OF CONTENTION PROTOCOLS PERMITTING STATISTICALLY INFREQUENT SIMULTANEOUS CO-FREQUENCY TRANSMISSIONS THAT BRIEFLY EXCEED THE MASK.

In its comments, ARINC proposed that the Commission adopt in this proceeding its proposal from the Part 25 streamlining proceeding to "allow VSAT operators to exceed the proposed aggregate off-axis EIRP envelope for a small percentage of the time." Boeing and ViaSat proposed the same rule in their comments, 53 and ARINC agrees with their analysis.

## V. FREQUENCY ALLOCATION AND TDRSS/RAS ISSUES.

### A. AMSS Operations Should Be Permitted in the Extended Ku-band.

The Commission should permit AMSS downlink operations in "extended" Ku-band.<sup>54</sup> Indeed, various commenters agree with this course of action,<sup>55</sup> and none oppose it. Accordingly, because allowing the use of the extended Ku-band will enable AMSS operators to operate globally at the same frequencies, the Commission should permit AMSS operations in this band.

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This is demonstrated by Boeing's Connexion system. Boeing, while initially authorized to transmit with the Telstar 6 satellite at 93° W.L., later modified its license to allow operations at the Americom 4 (AMC-4) satellite at 110° W.L. *See* The Boeing Company, Modification Application, FCC File No. SES-MFS-20050701-00853, Call Sign E000723, at 2-3 (July 1, 2005) (narrative statement). Although inefficiently required to obtain prior FCC approval, Boeing's shift of spacecraft for AMSS transmissions – as would be permitted under ALSAT – went unnoticed, and generated no complaints of harmful interference.

<sup>&</sup>lt;sup>52</sup> 2000 Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, Sixth Report and Order and Third Further Notice of Proposed Rulemaking, 20 FCC Rcd 5593, ¶ 136 (2005) ("Sixth R&O and Third FNPRM"). See also ARINC Comments at 24-25.

<sup>53</sup> See Boeing Comments at 18-20; ViaSat Comments at 12-14.

<sup>54</sup> See NPRM ¶ 18; ARINC Comments at 25-26.

See Boeing Comments at 8; Intelsat Comments at 2 n.5; SES Americom Comments at 4; and Telesat Comments at 2.

B. The Commission Should Allow AMSS Operators and NTIA to Determine Interference Protection Methods and Levels for Current TDRSS and RAS Sites, and Should Permit the Expansion of Future Sites Only in a Rulemaking.

The National Radio Astronomy Observatory ("NRAO") is correct that imposing RAS coordination requirements below 14.47 GHz is unnecessary. <sup>56</sup> The National Academy of Sciences' Committee on Radio Frequencies ("CORF"), however, is wrong that a "vicinity of" or "line-of-site" restriction should apply generically to all RAS sites, <sup>57</sup> because, like TDRSS sites, RAS sites require differing levels of protection, as ARINC has explained. <sup>58</sup> The proper approach for *current* sites is thus for NTIA and AMSS operators to agree on the appropriate method and level of protection *on a site-by-site basis*. Likewise, CORF's proposal for ad hoc coordination with regard to *future* RAS sites also should be rejected. <sup>59</sup> For future sites, whether RAS or TDRSS, requisite protection levels should be determined in future rulemakings pertaining to those particular sites. <sup>60</sup> Otherwise, there is no way for the Commission to ensure that AMSS providers will not be hamstrung by unreasonable coordination demands for future sites with unknown locations and undefined protection criteria.

Comments of the National Radio Astronomy Observatory, IB Docket No. 05-20, at 3-4 (Apr. 4, 2005). *See also* Boeing Comments at 12 (agreeing that coordination of RAS sites below 14.47 GHz is unnecessary).

Comments of the National Academy of Sciences' Committee on Radio Frequencies, IB Docket No. 05-20, 5 (June 30, 2005) ("CORF Comments").

<sup>58</sup> See ARINC Comments at 26-27.

<sup>&</sup>lt;sup>59</sup> CORF Comments at 8-9.

See ARINC Comments at 27-28. ARINC agrees with Boeing that coordination of future TDRSS sites will constrain Ku-band AMSS systems, that future TDRSS facilities must be designed with advanced interference rejection filtering to minimize the coordination impact on AES operations, and that any coordination requirement for future TDRSS sites be limited to the 14.0-14.2 band only. See Boeing Comments at 11-12.

# VI. THE NATIONAL SECURITY CONCERNS OF THE FEDERAL GOVERNMENT SHOULD BE ADDRESSED INFORMALLY BY AMSS PROVIDERS AND THE DEPARTMENTS OF JUSTICE AND HOMELAND SECURITY.

ARINC is sensitive to the public safety and national security concerns of the federal government.<sup>61</sup> However, each AMSS system is different and, accordingly, the Commission should abstain from adopting any rule of general applicability designed to address those concerns in a blanket fashion. The prudent approach, which takes into account both the public safety and national security concerns of the federal government and the unique system designs and capabilities of each AMSS operator, is for each AMSS provider to work informally with the Departments of Justice and Homeland Security to address their legitimate needs and concerns.

### VII. CONCLUSION.

For the reasons stated herein, the Commission should adopt AMSS service rules in accord with ARINC's initial comments and these reply comments.

Respectfully submitted,

ARINC INCORPORATED

By: \_/s/ John L. Bartlett\_\_\_\_\_

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See Comments of the Department of Justice, Including the Federal Bureau of Investigation, and the Department of Homeland Security, IB Docket No. 05-20 (July 5, 2005).